

Contributions from the Department of Biology, University of
Western Australia—No. 1.

Protocrangonyx fontinalis, a new blind freshwater Amphipod
from Western Australia, by **George E. Nicholls, D.Sc., F.L.S.**,
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In December, 1923, with Miss Milner, I described a new Phreatoicid, *Hyperaedesipus plumosus*, taken by myself during the previous winter, in a spring near Lesmurdie Falls. With this were collected a few small, blind and transparent Amphipods, which form the subject of the present communication. The general appearance of both of these Crustaceans was highly suggestive of a subterranean habitat. Associated with them were a number of translucent white planarians. The spring flows only for a brief period after heavy rainfall, and it is practically certain that these forms are swept to the surface only when the water gushes up strongly from below and are then to be looked for, hiding from the light, beneath decaying vegetable matter accumulated in the little hollow immediately below the inch-wide orifice of the spring. A somewhat similar condition, apparently, was found by Sayce (1902) in the association of *Phreatoicoides gracilis*, *Janirella pusilla* and *Niphargus pulchellus*, all blind forms occurring in surface waters in Victoria. Sayce supposed, however, that this was an attempt on the part of blind subterranean forms to re-occupy surface waters permanently. It would appear much more probable that, like the association I have described, it is merely an accidental and involuntary temporary reversion to life at the surface. Undoubtedly these surface-living individuals and their offspring must either perish at the onset of the dry weather, or, creeping after the retreating moisture, return to their subterranean haunts. That they do so retreat, or more probably that some escape being swept to the surface, and continue to lead a subterranean life, is evident, for during the next two winters (1924 and 1925) the spring was not found running, and no specimens were to be discovered, although the spot was frequently visited and carefully searched, but in the present winter, the first visit of the season, made on May 26th, after several days of heavy rainfall, yielded more than a hundred specimens of both Amphipod and Isopod,

the planarian being less abundant. An extended search, lasting the whole day, revealed the Amphipod, occurring not very abundantly, in another similar spring some hundreds of yards lower down the valley, but *Hyperoedesipus* was not found there.

The Amphipod proved not only to be new, but to exhibit a combination of characters which made it difficult to assign it to any described genus; coming nearest, perhaps, to *Eucrangonyx* (known only from Central Europe and North America), from which it differs principally in the shape of the telson and certain of the mouth parts. From the New Zealand genus *Paracrangonyx* it was excluded by its retention of both the rami of the pleopods. It is clearly marked off from *Crangonyx*, to which it has obvious affinities, by its possession of an inner ramus to the third uropod, which has been lost in *Crangonyx*; some species of this genus, however, have preserved the entire condition of the telson, as have the single species of both *Paracrangonyx* and *Apocrangonyx*. The latter, however, has lost both rami from the third uropod. In its mouth parts, the Lesmurdie specimen approaches more closely to *Paracrangonyx* and to *Neoniphargus* (an Australian genus), from which latter it is readily distinguished by the cleft telson and elongate third uropod of that genus. It has been found necessary, therefore, to constitute a new genus for the reception of this Western Australian form, for which I propose the name *Protocrangonyx*.

PROTOCRANGONYX gen. nov

Body compressed, not carinate. Side-plates shallow, 1—4 scarcely deeper than the following. Eyes absent. Antenna 1 the longer, accessory flagellum small, 2-jointed. Upper lip rounded, lower lip with indistinct inner lobe, mandibular palp with 2nd joint longer than 3rd, maxilla 1 inner plate with a single seta, palp differs on the two sides, maxilla 2 inner plate partly fringed on both inner and outer margins, maxilliped with outer plate reaching to middle of 2nd lobe of palp, and set mesially with stout spines and setae. Gnathopods 1 and 2 equal, subchelate, 6th joint not markedly wider than 5th. Peracopods 3—5, 2nd joint slightly expanded, accessory branchiae on 3 and 4. Uropods 1—3 projecting backwardly to the same level, rami unequal, uropod 3 small, with short 1-jointed outer ramus, inner ramus reduced to a scale. Telson small, entire.

Protocrangonyx fontinalis sp. nov.

Body slender. Side plates shallow, side-plate 4 the deepest. Pleon segments 1—3 broader than the preceding, a couple of setules on each dorsally, usually two or three setae upon ventral margin of each plate; postero-lateral corners quadrate or obtusely quadrate. Eyes wanting. Antenna 1 almost half the length of the animal, flagellum with 12—13 joints, twice as long as peduncle; accessory flagellum 2-jointed, usually as long as first two articuli of flagellum. Antenna 2 two-thirds length of antenna 1, 4th joint of peduncle

considerably longer than 5th, flagellum of 7 joints equal to combined length of peduncle joints 3—5. Upper lip rounded, lower lip with inner lobe not distinct. Mandible with cutting edge and accessory plate dentate, 4 or 5 spines in spine row, palp 1st joint longer than broad, 2nd joint longer than 3rd; accessory plate slighter on right mandible. Maxilla 1 inner plate small, rounded apically with a single feebly plumose seta, outer plate with 8 (9) pectinate strongly chitinised setae, 2nd joint of palp with 6 (occasionally 5) stout tooth-like spines on apex. On the opposite side these spines are replaced by a like number of stiff setae, feebly plumose. Maxilla 2 both plates with 12-14 curved setae apically, outer plate fringed with fine setae, externally, inner plate with similar fringe on both inner and outer margins and at summit of inner margin a couple of stiff plumose setae. Maxilliped outer plate broader than inner, armed mesially with several stout spines (? spine teeth) and three longer setae, apically set with a number (6-7) of curved spine teeth extending to middle of 2nd joint of palp, palp moderate, 4th joint with nail.

Gnathopods 1 and 2 similar, 5th joint triangular, cup-shaped, 6th much longer, broad at base, widest at middle; palm oblique, guarded by a few setae and stout spines with notch and cilium near tip; finger strong, curved. Peraeopods 1—3 subequal, shorter and more slender than peraeopods 4 and 5; 2nd joints peraeopods 3—5 oblong oval; accessory branchiae, long oval in shape, on peraeopods 3 and 4.

Uropods 1 and 2 projecting as far backwards as uropod 3; uropod 1 peduncle considerably longer than the rami, of which outer is shorter than inner; uropod 2 peduncle as long as the longer (inner) ramus; uropod 3 short stout peduncle slightly longer than the outer 1-jointed ramus, inner ramus a minute scale without setae or spines.

Telson rounded, entire, shorter than ramus of uropod 3, twice as broad as long, armed posteriorly with one pair of large and one of smaller spines.

Spines on rami of uropods and telson are notched and bear each a curved cilium near the apex.

Length of largest specimen barely exceeding 5 mm.

Colour.—In life, creamy white and semi-transparent.

Habitat.—Taken beneath mud and decayed vegetable matter, around the orifices of small springs in the valley of the Yule Brook, below the Lesmurdie Falls, in the Darling Range. Evidently normally subterranean, but brought to the surface when the water wells up unusually strongly after exceptionally heavy rainfall.

The smooth *body*, Pl. VIII, Fig 1, almost wholly free from conspicuous setae is somewhat narrowly compressed, the impression of

slenderness being enhanced by the shallowness of the side plates, and the slightness of the expansion of the second joints of the hinder peraeopods. Thus in females, only partly grown, the developing marsupial plates hang down well below side-plates 2—4, while the oval branchiae, both primary and accessory, are clearly visible pendant between the 2nd joints of the peraeopods.* On each of peraeon segments 5 and 6 two pairs of these gills occur, the more anteriorly placed apparently being the supplementary structure.

The *head* is relatively short, without rostrum and exhibiting no trace of eyes.

In the *peraeon*, the segments are sub-equal, the third, fourth and fifth being very slightly narrower. The dorsal margin of the side-plates is very slightly indicated and difficult to determine. The fourth side-plate shows very little posterior emargination, and the lobing of side-plates 5—7 is little developed. This slight development of the side plates, giving a sub-cylindrical shape to the slender body is doubtless an adaptation to the subterranean life, permitting more ready passage through the narrow crevices in the granitic rock.

In the *pleon*, the first three segments are wider than the preceding and as deep as the combined depth of segment and side-plate. In the mid-dorsal line these three segments each bear on the posterior margin a couple of a small simple setae, the peraeon segments and those of the *urus* being devoid of such setae.

Appendages.—In the *upper antennae*, the three joints of the peduncle diminish progressively in length and stoutness. The flagellum has twelve or thirteen articuli (sometimes differing on opposite sides). The 2-jointed accessory flagellum usually has a length almost equalling the first two articuli of the main flagellum, but is occasionally found much shorter, the second (terminal) joint in these cases being very small. In one specimen, on one side, there were present three, almost equal, joints.

Of the *lower antenna*, the two proximally situated joints of the peduncle are fused with the head, the sutures remaining quite distinct; the three succeeding joints (3—5) are stout, the third much the shortest, the fourth slightly longer than the fifth. The flagellum, also, is relatively stouter than that of the upper antenna, consists of seven joints which together are very slightly longer than the three free joints of the peduncle.

The mouth parts have already been described in some detail in the specific diagnosis. A few further notes may be added here.

The *upper lip* (Pl. VIII. Fig. 2) is rounded, as in *Neoniphargus spenceeri*, but much more setose. The *lower lip* (Pl. VIII. Fig. 3)

*Cf. *Niphargus pulchellus* Sayce (1900, Vol. 12, Pl. 15, Fig. 1).

has the median lobe less well defined and the setae of the ventral border are not very numerous. The outer limit of the setae on the left side is defined by a short stout spine which is, perhaps, present also in *Neoniphargus spenceri* and *Niphargus pulchellus* [Cf. Sayce's figures (1900, Pl. 16, Fig. 5, and 1900a, Pl. 40, Fig. 2)], though Sayce makes no mention of it. I find a somewhat similar structure in *N. branchialis*. (1924, Pl. 10, Fig. L.2). Mandibular processes are well developed.

The *left mandible* (Pl. VIII, Fig. 4) is much as in *Niphargus pulchellus* (1900, Pl. 16, Fig. 4), but the accessory dentate edge is more widely separated from the principal cutting edge. The *right mandible* (Pl. VIII, Fig. 4a) approximates much more nearly to the condition figured by Sayce for *Neoniphargus spenceri* (1900a, Pl. 40, Fig. Mr.).

The *first maxilla* (Pl. VIII, Fig. 5) somewhat resembles that of *Neoniphargus branchialis* (1924, Pl. 10, Fig. M1) and *N. thomsoni* (1893, Pl. 6, Fig. 5). The small rounded inner lobe is crowned by a single slight, scarcely plumose seta set in a general fringe of delicate setae. The outer plates are relatively larger and are armed apically with 8 (or 9) strongly chitinised pectinate setae with an innermost simple seta. The palp, which differs on opposite sides, is broader relatively (as compared with *N. branchialis*.) On the one side it bears terminally 6 short conical spines, while on the other (Pl. VIII, Fig. 5a) these are replaced by five stiff setae sparsely plumose,

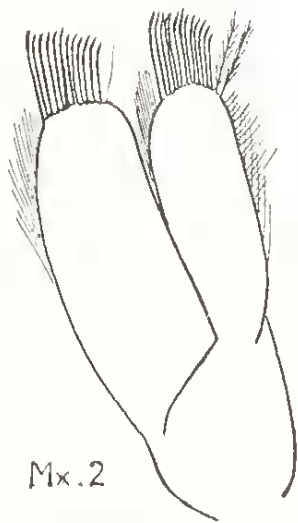


FIG. 1.—*Protoerangonyx fontinalis* sp. nov. Second Maxilla.

The *second maxilla* (Fig. 1) has the outer plate the broader; it is fringed externally with delicate setae and crowned with a dozen stiffly curved setae. The inner plate has the fringe of setae on

both inner and outer margins and an apical set of fourteen curved setae and two inner plumose setae, an arrangement closely paralleled in *Neoniphargus spenceeri* (1900a, Pl. 40, Fig. M2).

The *maxilliped* (Pl. VIII, Fig. 6) has somewhat narrow inner plate with 3 apical spine-teeth; the broader outer plate has six apical curved setae (spine-teeth), somewhat more slender setae forming a fringe along the inner margin of this plate; proximally there are three long straight setae.

The two *gnathopods* (Pl. VIII, Fig. 7) are alike, not very strong and apparently similar in both sexes. In these (and in the *peraeopods* 1 and 2) the second joint is of narrow oblong shape, its posterior margin bearing a number of elongate flexible setae. The palm is quite oblique, has a sharp dentate edge and is guarded by spines and setae (Pl. VIII, Fig. 7a). The legs generally are slender* a slight widening of the second joint of *peraeopods* 3—5 producing a narrowly oval structure. The shallowness of the side plates 5—7 exposes a narrow distal portion of the first joint.

The *pleopods* are biramous, of moderate length, with unequal rami, the third pair distinctly shorter than the preceding.

The *uropods* (Pl. VIII, Fig. 1) consists of a stout peduncle with a pair of slender and unequal rami, armed with spines. In the first and second uropods it is the inner ramus which is the longer. In uropod 1 the peduncle is half as long again as the longer ramus and twice as long as the outer ramus. The second and third uropods have the peduncle subequal in length to the longer rami. The third uropod (Pl. VIII, Fig. 9) has the inner ramus represented by a small scale which bears neither spine nor setae and reaches a length barely a third of the peduncle. The *spines* on telson (Pl. VIII, Fig. 10) and uropod, as already noted, are peculiar, being stout, notched near the apex to receive a slender curved cilium. This form of spine is (vide Stebbing, 1906, pp. 372-373) apparently of constant occurrence in species of the genus *Crangonyx*. Of the setae found, in *ProtoCrangonyx fontinalis*, upon the *peraeopods* some are of this character as are the few setae occurring upon the basal joints of the *pleopods* (the long setae upon the rami of the *pleopods* are plumose), but most of the setae upon the legs as well as those near the ventral margins of the side-plates and pleon segments appear to be simple setae.

Remarks.—As noted above, the affinities of this species seem to be in nearly equal degree with the forms grouped under

*As an abnormal development, one specimen showed the 1st *peraeopods* as stout and as long as the 4th or 5th.

Crangonyx, *Paracrangonyx*, *Eucrangonyx*, and *Neoniphargus*.* In the genus *Crangonyx* are placed a number of species (mostly from wells and springs in North America), in which the telson may be either entire or cleft in varying degree. In all of these, however, the inner ramus of the third uropod has disappeared. In *Eucrangonyx* (habitat and distribution agreeing with that of *Crangonyx*) with one of the species of which (*E. vejdoskyi*) the Western Australian form shows many points of agreement, the genus is defined as possessed of an emarginate telson. Had the telson in this genus been variable, as it is in *Crangonyx*, I should have been inclined to refer the new species to it. To the New Zealand form, *Paracrangonyx compactus* (Chilton), also, *P. fontinalis*, comes very near inasmuch as although both rami of the pleopods are retained in the latter, there is a marked difference in the degree of development of the two rami, one apparently undergoing retrogression. In both the telson is entire. The mouth parts, too, are more nearly alike, the inner plate of maxilla 1 being small and with but few setae (2 and 1 respectively), whereas in *Crangonyx* and *Eucrangonyx* the inner plate has numerous (4—6) setae. In the condition of the mouth parts, *P. fontinalis* approaches, also, to *Neoniphargus*, but in this genus the telson is cleft and the third uropod elongated.

In the character of the setae it is interesting to note that the notched seta with the cilium is found not only in *Crangonyx* and *Protoarangonyx*, but also in *Neoniphargus*. In this genus I find it in a blind Victorian species (*N. obrieni*, 1926), and also in another blind form, *N. westralis* Chilton (1925). What may readily be a transitional condition in the evolution of this type of seta is figured by Sayce in his account of *Niphargus pulchellus* (1900, Pl. 16, Fig. 12), where a stout plumose seta, occurring near the base of a pleopod ramus, is shown with one branch closely comparable in position and size to the *Crangonyx* cilium. Upon the dactyl of the peracopods (Pl. VIII, Fig. 8) there is in *P. fontinalis* a single stiff seta in the position occupied in *Neoniphargus* by the characteristic, well-developed plumose seta.

*All of these genera are, however, represented almost entirely by forms which have taken to a subterranean mode of life, and while the resemblances may well be explained by a common ancestry, it is possible that many of their common features may be due to convergence resulting from adaptation to a similar manner of life.

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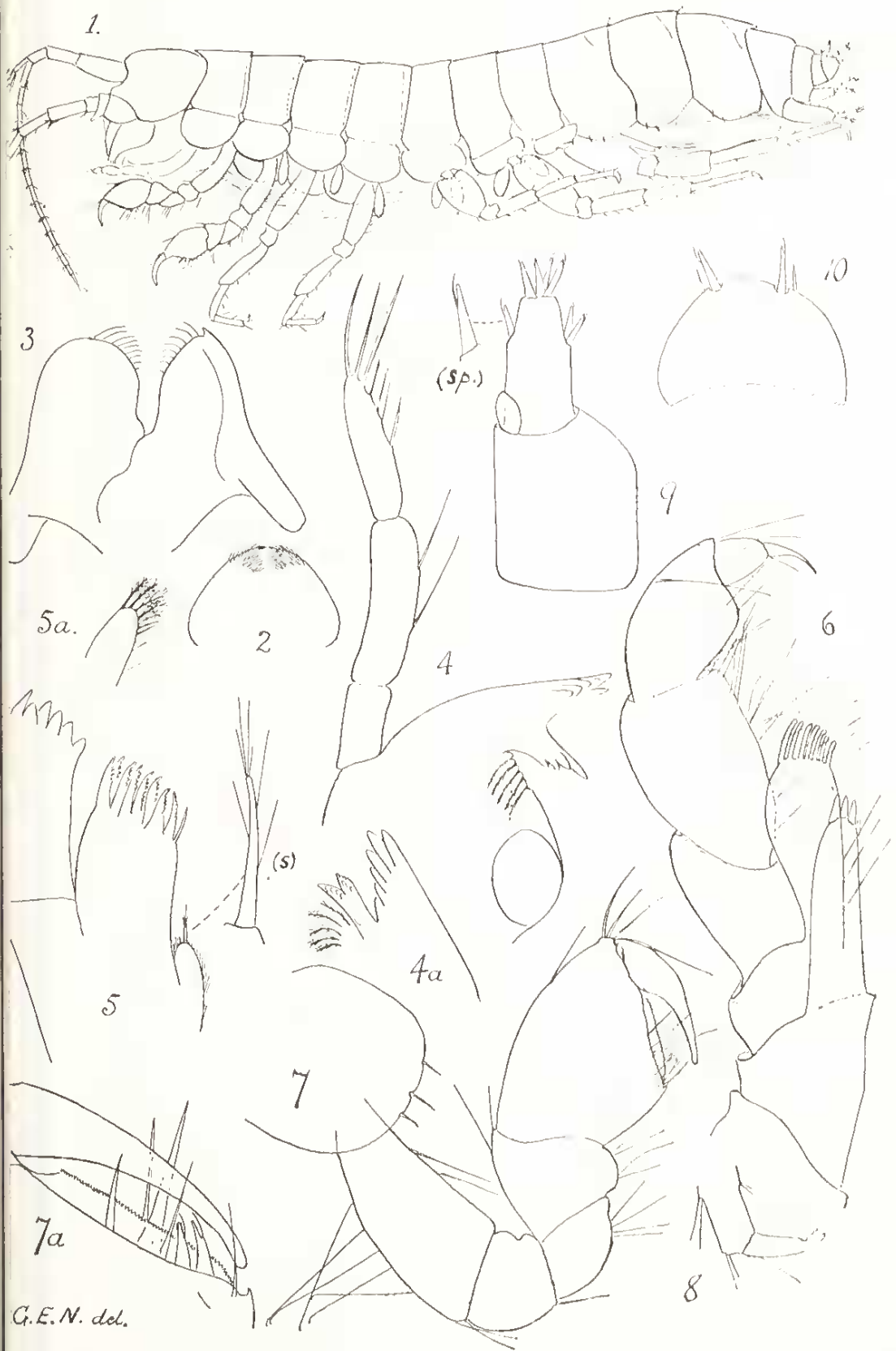
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EXPLANATION OF PLATE VIII.

Protoerangonyx fontinalis mihi.

1. Entire animal.
2. Upper lip.
3. Lower lip.
4. Left mandible; in the spine row the spines are seen bent back.
- 4a. Right mandible, cutting edges.
5. First maxilla, with enlarged setas.
- 5a. Palp of first maxilla, of opposite side.
6. Maxilliped.
7. Gnathopod.
- 7a. Palm of gnathopod, still further enlarged.
8. Dactyl of Peracopod 1.
9. Third uropod, seen from above, with enlarged spine (sp).
10. Telson.



G.E.N. del.